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The effect of early mobilization on complications after chronic subdural hematoma surgery

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ABSTRACT

Aims: Chronic subdural hematoma is a common condition in the elderly population that often requires hospitalization. While some patients are discharged without surgery, others require surgical intervention due to symptoms such as loss of strength and consciousness. Preventing postoperative complications is as important as the surgical procedure itself. Early mobilization facilitates patients' return to routine daily life, thereby reducing complications associated with immobility. This study will examine the effect of early mobilization on postoperative complications.

Methods: This study included 34 patients diagnosed with chronic subdural hematoma who underwent surgical intervention at our institution between 2020 and 2024. Data collection encompassed findings from preoperative and postoperative neurological examinations, comorbid conditions, the extent of midline shift, time to postoperative mobilization, duration of intensive care unit stay, length of ward stay and overall hospitalization, as well as the incidence of postoperative complications. Patients in satisfactory general condition commenced oral feeding on the morning following surgery and were monitored under controlled conditions. The patients were divided into two groups: those who were mobilized and those who were not. These groups were then compared in terms of time to mobilization, postoperative complications, length of hospital stay, and mortality rates.

Results: A comparison of postoperative complications between mobilized and non-mobilized patients revealed a significantly lower incidence of complications in the mobilized group ($p<0.001$). Analysis of intensive care unit (ICU) stay duration ($p<0.001$) and total hospital length of stay ($p<0.001$) also indicated that both ICU and overall hospital stays were significantly shorter in the mobilized group. Mortality rates were notably higher in the non-mobilized group ($p=0.005$). Furthermore, when analyzing only the mobilized group, patients who experienced postoperative complications had a significantly later mobilization time compared to those without complications ($p=0.041$). A strong, positive correlation was also found within the mobilized group between the timing of mobilization and total hospital stay duration.

Conclusion: Early mobilization following chronic subdural hematoma surgery facilitate patients' reintegration into daily activities. Additionally, these measures minimize complications associated with immobilization and significantly reduce the length of hospitalization.

Keywords: Chronic subdural hematoma, early mobilization, postoperative complication, length of hospital stay

INTRODUCTION

Chronic subdural hematoma (CSDH) is commonly observed in the elderly population, with an estimated annual incidence of 58 cases per 100,000 individuals.[1] A 2011 study reported an annual incidence of CSDH of 80.1 cases per 100,000 individuals in those over 65 years of age, and 127.1 cases per 100,000 individuals in those over 80.[2]

While most patients experience favorable outcomes following surgery, postoperative mortality in CSDH ranges from 0% to 32%, with morbidity rates between 0% and 25%. However, recent data indicate that operative mortality generally ranges from 2% to 5%.[3,4]

Among the significant factors influencing mortality and morbidity, postoperative complications include focal brain injury, acute postoperative subdural or intracranial hemorrhage, seizures, surgical site infections, subdural empyema, and tense pneumocephalus.[5]

Postoperative medical complications, including pulmonary embolism, urinary tract infection, arrhythmia, ileus, cerebrovascular events, diabetes mellitus, and hypertension, are as critical as procedure-specific complications. In recent years, there has been a growing emphasis on studies aimed at preventing these medical complications, underscoring their

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significance.[6] In this context, early mobilization has gained critical importance and is now recognized as essential for preventing these complications and promoting functional recovery.[6,7]

Three primary surgical techniques are utilized in the treatment of chronic subdural hematoma: twist-drill craniostomy (TDC), burr-hole craniostomy (BHC), and craniotomy.[4,8,9] Although studies yield slightly varying conclusions, the prevailing consensus is that craniotomy is associated with a lower recurrence rate relative to the other techniques, albeit with higher morbidity and mortality. Conversely, TDC demonstrates the lowest morbidity and mortality rates but is linked to a higher recurrence rate. As a result, BHC is generally recommended, as it provides an optimal balance between efficacy and risk.[3,4,10]

This study will examine the effects of early mobilization on reducing postoperative complications in patients with chronic subdural hematomas treated using the BHC technique.

METHODS

Ethical Approval

The study was carried out with the permission of the Hitit University Erol Olçok Training and Research Hospital Scientific Researches Evaluation and Ethics Committee (Date: 05.04.2024, Decision No: 2024-08). We obtained an informed consent form from all patients for procedure. All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki. Retrospective analysis was performed on patients who were hospitalized between January 2020 and September 2024.

Method

Cases of CSDH hospitalized between 2020 and 2024 were retrospectively reviewed using the hospital database. The study included 34 patients over the age of 65 who underwent unilateral CSDH surgery. Patients presenting with hemiparesis due to cerebrovascular diseases were excluded. Data on metabolic conditions such as diabetes mellitus, hypertension, anticoagulant use, and coronary artery disease were extracted from the database. Patients who underwent surgery were divided into two groups: those who were mobilized postoperatively and those who were not. The demographic characteristics of patients in each group, as well as preoperative and postoperative midline shift measurements, neurological examination findings, durations of intensive care unit stay, ward stay, and total hospital stay, postoperative complications, and mortality rates were recorded. Additionally, for patients in the mobilized group, the specific postoperative day on which mobilization occurred was noted (**Table**).

Table. Demographic characteristics and preoperative/postoperative data of the study groups

	Mobilized group	Immobilized group	Total
Number of patients	21	13	34
Age (mean)	78	84	80.38
Gender (female/male)	10/11	6/7	16/18
Preoperative hemiparesis	19 pateints	13 pateints	32 pateints
Postoperative hemiparesis	1 pateint	13 pateints	14 pateints
Preoperative midline shift (mean)	12.33 mm	15.08 mm	13.38 mm
Postoperative midline shift (mean)	5.62 mm	8.77 mm	6.82 mm
Length of ward stay (mean)	5.38 days	4.62 days	5.09 days
Length of ICU stay (mean)	1.38 days	8.23 days	4 days
Total hospital stay (mean)	6.76 days	12.85 days	9.09 days
Mortality	0	5 pateints	5 pateints
Postoperative complication	3 patients: 3 patients: Seizure	11 patients: 1 patient: Arrhythmia/ coronary artery disease 3 patients: Atelectasis 2 patients: Deep vein thrombosis 3 patients: Urinary tract infection 1 patient: Midline shift 1 patient: Seizure	14 patients
Mobilization time (mean)	1.9 days 1. day: 11 patients 2. day: 3 patients 3. day: 6 patients 5. day: 1 patient		

mm: Milimeters, ICU: Intensive care unit

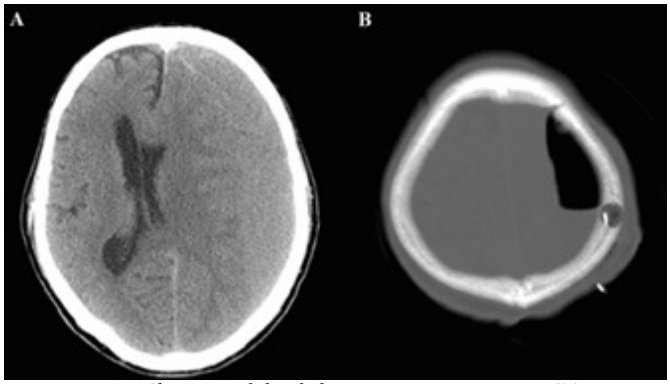

Figure 1. A: Chronic subdural hematoma preoperative CT scan, B: Postoperative CT scan burr hole craniostomy

CT: Computerized tomography

Surgical Procedure

Patients underwent surgery under sedation with local anesthesia via a single burr hole (**Figure 1**). Sedation was achieved using midazolam (0.01 mg/kg), fentanyl (0.5 mcg/kg), and propofol (1.5 mg/kg). Subdural drainage catheters were placed in all patients. For patients on anticoagulant or antiaggregant therapy prior to surgery, these medications were discontinued following cardiology consultation. Postoperative follow-up was conducted in the intensive care unit and the neurosurgery department.

Postoperative Management

Routine cranial computerized tomography imaging was performed on patients after surgery. Oral feeding of patients who were followed up in the ward after surgery was started the next morning. And patients who were provided oral feeding were walked in the ward corridor, which was approximately 30 meters long, in the morning and evening. Compression stockings were removed after walking. Patients with poor

general condition and hemiparesis before surgery were mobilized with wheelchairs. Subdural drains were removed from patients 48-72 hours after surgery. Cranial imaging was performed again after drain removal.

Statistical Analysis

Data analyses were conducted using the SPSS 22.0 software program for Windows. Descriptive statistics for numerical variables were presented as mean, standard deviation, median, and minimum-maximum values, while categorical variables were expressed as percentages and frequencies. Since the Shapiro-Wilk test indicated that quantitative data did not follow a normal distribution, non-parametric test procedures were applied. Specifically, the Mann-Whitney U test and Spearman's Rho correlation test were employed to assess relationships between parameters. The chi-square test was used for bivariate analyses of categorical variables. Results were evaluated within a 95% confidence interval, with a p-value of <0.05 considered statistically significant.

RESULTS

Of the 34 patients, 18 were male and 16 were female. Seven patients with good general condition postoperatively were transferred directly to the inpatient ward, while 27 patients were initially monitored in the intensive care unit before being transferred to the ward. Preoperatively, hemiparesis was present in 32 patients, with 19 in the mobilized group and 13 in the non-mobilized group. Postoperatively, improvement in hemiparesis was observed in 18 patients within the mobilized group. The average midline shift among all 34 patients was 13.38 mm preoperatively, which decreased to an average of 6.82 mm in the early postoperative cranial CT (computerized tomography) scans. The average total hospital stay and intensive care unit stay were 9.09 days and 4 days, respectively, with both durations being lower in the mobilized group. One patient undergoing anticoagulant therapy experienced rebleeding and required a second surgical intervention. During follow-up, epileptic seizures occurred in four patients, urinary tract infections developed in three patients, deep vein thrombosis was observed in two patients, and three patients exhibited atelectasis and respiratory distress. Mortality occurred in five patients (**Table**).

When the mobilized and non-mobilized groups were compared, the mobilized group showed a statistically significant reduction in postoperative complications ($p<0.001$). Similarly, when comparing the total hospital stay ($p<0.001$) and intensive care unit stay ($p<0.001$) between the two groups, statistically significant differences were found in favor of the mobilized group. When mortality rates were evaluated between the two groups, a statistically significant higher mortality rate was observed in the non-mobilized group ($p=0.005$).

Analysis within the mobilized group indicated that postoperative complications increased as the time to mobilization was further delayed ($p=0.041$). In the mobilized group, a significant, positive, and strong correlation was observed between delayed mobilization and increased total length of hospital stay (**Figure 2**).

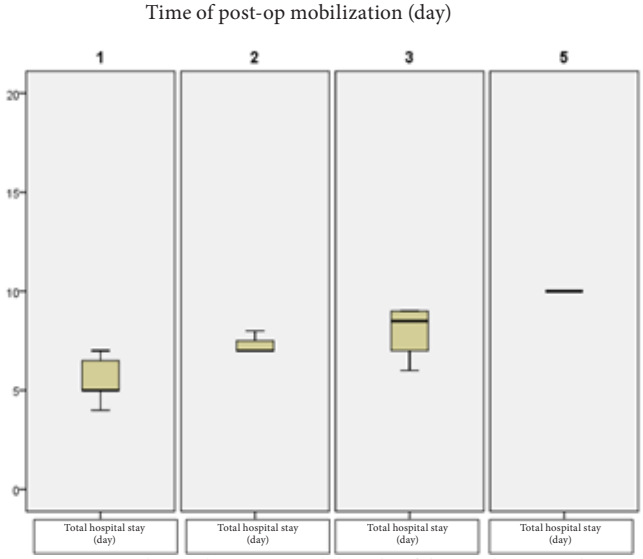

Figure 2. Correlation between total length of hospital stay and time to mobilization

DISCUSSION

Since CSDH is seen in the elderly population, there are many factors that affect the mobilization of patients. The most important factors are the amount of shift in the brain tomography before surgery and the patient's loss of strength during the examination. Performing surgery under sedation also plays an important role in early oral feeding and mobilization.[11]

In addition, the patient's relatives' support for the patient's nutrition and motivating the patient to walk are other important factors that accelerate mobilization. Patients who switch to oral intake early can also easily take their medications. Thus, monitoring of diseases such as diabetes and hypertension is easier. Deep vein thrombosis and pulmonary embolism are less common in patients who provide nutrition and start walking early. In addition, the rate of urinary tract infection is minimized in mobile patients who do not need a urinary catheter.[6]

Atelectasis is frequently seen in patients admitted to intensive care after surgery. Postural breathing exercises may not be given sufficiently to all patients in intensive care, and this increases respiratory distress.[12] In patients followed in the inpatient ward, psychological stress in the patient is reduced with the support of the patient's relatives. In patients with dysphasia, communication with their relatives contributes to the recovery of the patient.[13]

In the study of Adeolu et al.,[14] it was stated that early or late mobilization had no significant effect on postoperative complications. It was emphasized that pneumocephalus would increase and slow down the recovery in early mobilization. In support of this study, in our study, patients with less pneumocephalus and good general condition were encouraged to walk. Patients with severe headache, dizziness and tendency to sleep should not be walked.

In the study by Abouzari et al.,[15] it was stated that early mobilization would increase the rate of recurrent bleeding and had no effect on postoperative complications. In our study, no recurrent bleeding was detected due to early mobilization. Contrary to this study, late complications were less common in patients who were mobilized early.

Postoperative patient follow-up cannot be performed to the same standards in every center. This situation also affects the data in the studies. New studies emphasize the development of a new rehabilitation modality after chronic subdural hematoma surgery. Many parameters such as postoperative

patient position, antiaggregant and anticoagulant use, drain follow-up period, oral feeding process, patient mobilization should be included in new studies.[16,17]

The aim should not be only the timing of mobilization and early discharge. It is to standardize the patient's entire medical treatment with a holistic approach and to increase long-term survival. For this, multicenter studies with a large number of patients are needed.

Limitations
The limited number of patients constitutes the primary limitation of our study.

CONCLUSION
Early mobilization following CSDH surgeries should be considered an essential factor in reducing postoperative complications, hospital stay duration, and even mortality. Initiating mobilization as soon as possible facilitates the patient's reintegration into daily life. Further studies are needed to provide deeper insights into this subject.

ETHICAL DECLARATIONS

Ethics Committee Approval
The study was carried out with the permission of the Hitit University Erol Olçok Training and Research Hospital Scientific Researches Evaluation and Ethics Committee (Date: 05.04.2024, Decision No: 2024-08).

Informed Consent
Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process
Externally peer-reviewed.

Conflict of Interest Statement
The authors have no conflicts of interest to declare.

Financial Disclosure
The authors declared that this study has received no financial support.

Author Contributions
All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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